Research Translation

GOAL: "Move research findings/technology into decision-making processes through communication" (Dr. William Suk)

WHY? ……to strengthen public, private, tribal and/or non-profit efforts aimed at improving human health and the environmental systems upon which human health depends.

HOW? ……create innovative knowledge-action collaboratives that can holistically integrate biomedical, geochemical, engineering, social and information sciences in applied contexts.

San Diego-Tijuana City-Region

Community Outreach Core

Dr. Keith Pezzoli, Core Leader; Dr. Richard Marciano, Co-Leader; Dr. David Pellow, Co-Leader
(Core Leader and Co-Leader bios)

Integrating Superfund Science and Traditional Environmental Knowledge:
A Tribal Regional Workbench Approach

Tribal Partners

Michael Connolly, Laguna Resources, Campo Indian Reservation
Phil Green, Environmental Coordinator, Campo Tribal EPA
Ralph Goff, Tribal Chairman, Campo Indian Reservation
David Conrad, Executive Director, National Tribal Environmental Council (NTEC)
Lisa Gover, NTEC and Superfund Working Group
Dean Mike, Tribal Chairman, 29 Palms Tribal EPA
Dr. Marshall Cheung, Environmental Coordinator, 29 Palms Tribal EPA
Ken Bailey, Bureau of Indian Affairs

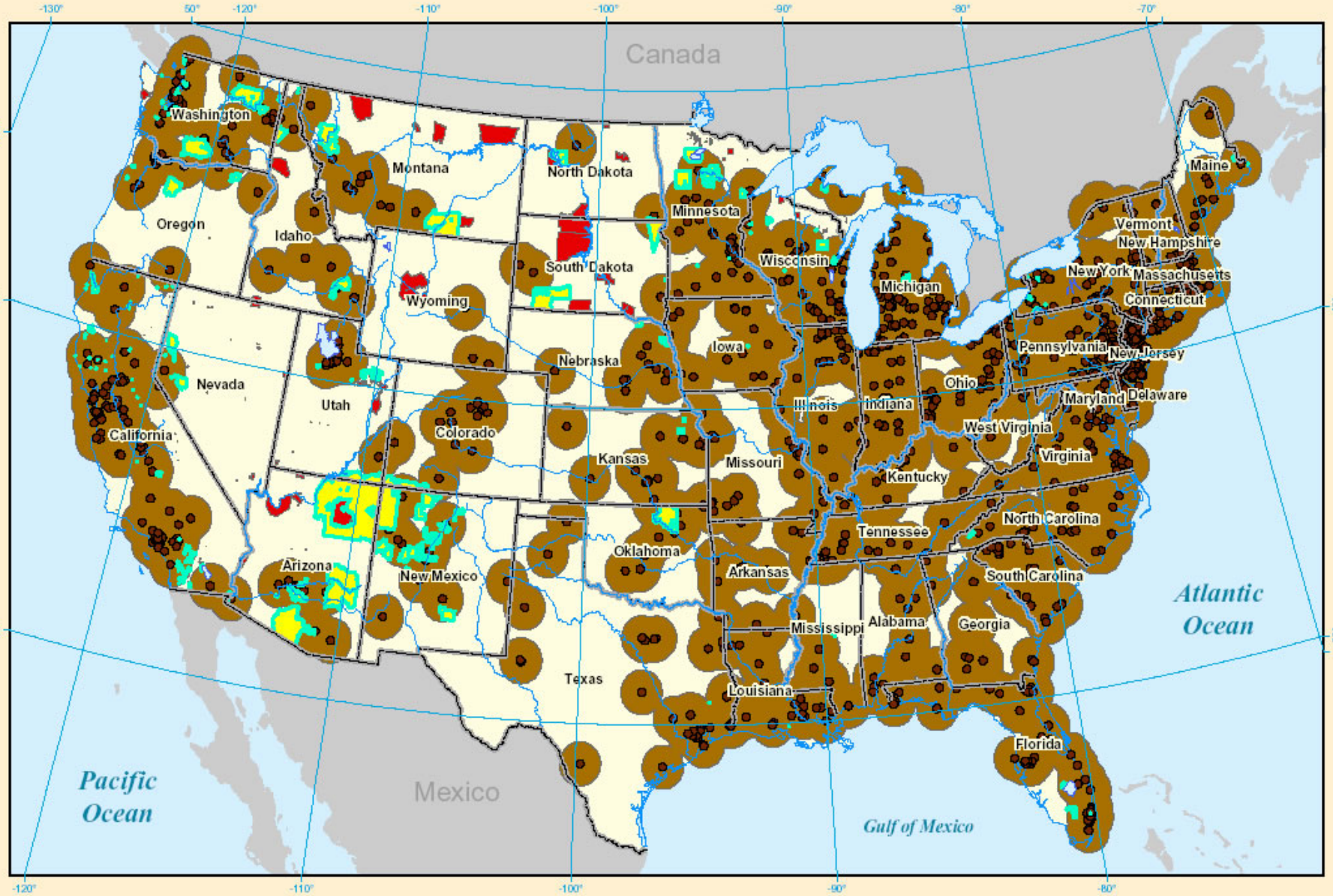
Superfund sites/ w 50 mile buffer

US EPA Region 9 Indian lands

Indian Lands near Superufund Sites

SBRP Case Study Areas

Kumeyaay Historic Map by Mike Connolly



Reservations near Superfund sites
Indian Reservations
Superfund Sites
50 miles buffer of Superfund sites

Tribal Lands and Superfund Sites

319 out of 542 Indian Reservations are within 50 miles from Superfund Sites

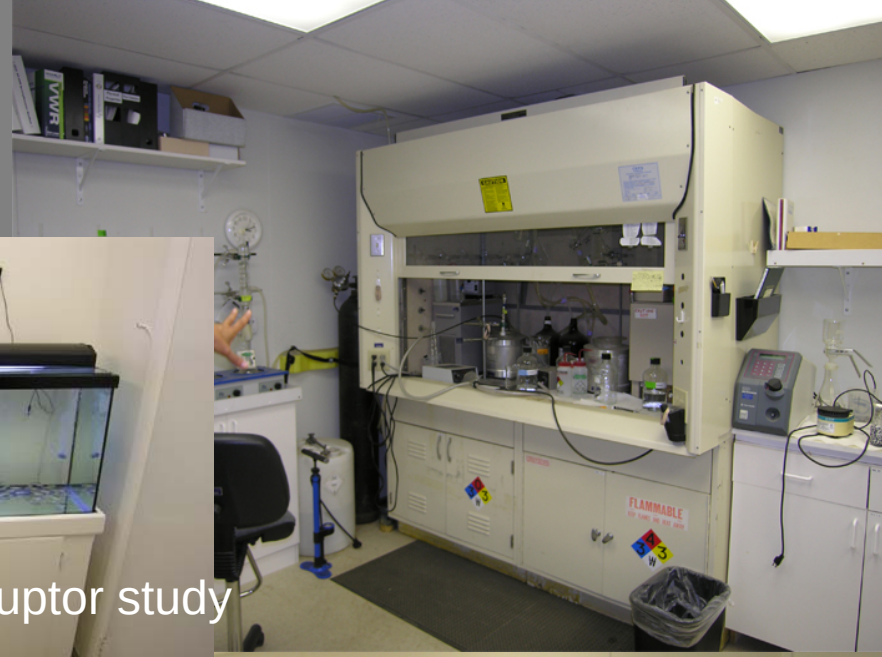
0 50 100 200 300 Miles

UCSD SBRP Outreach Team
March 2004

Sources: ESRI Data & Maps CD
US Federal Lands database
EPA CERCLIS database

- Tour of Dr. Robert Tukey's lab for tribal science partners
  Thursday, July 28, 2005
  Dr. Marshall Cheung, Director 29 Palms Tribal science lab

Endocrine disruptor study



Visit to 29 Palms Tribal Science Lab

Research Translation Core

Dr. Keith Pezzoli, Core Leader

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web: http://regionalworkbench.org

Applying toxicogenomics and biomolecular technologies to environmental monitoring, risk assessment and bioremediation

SBRP Research Translation Core proposal text (pdf file, 1.8m)
SBRP Research Translation Core letters of support (pdf file, 21.0m)

3 required components

SBRP network

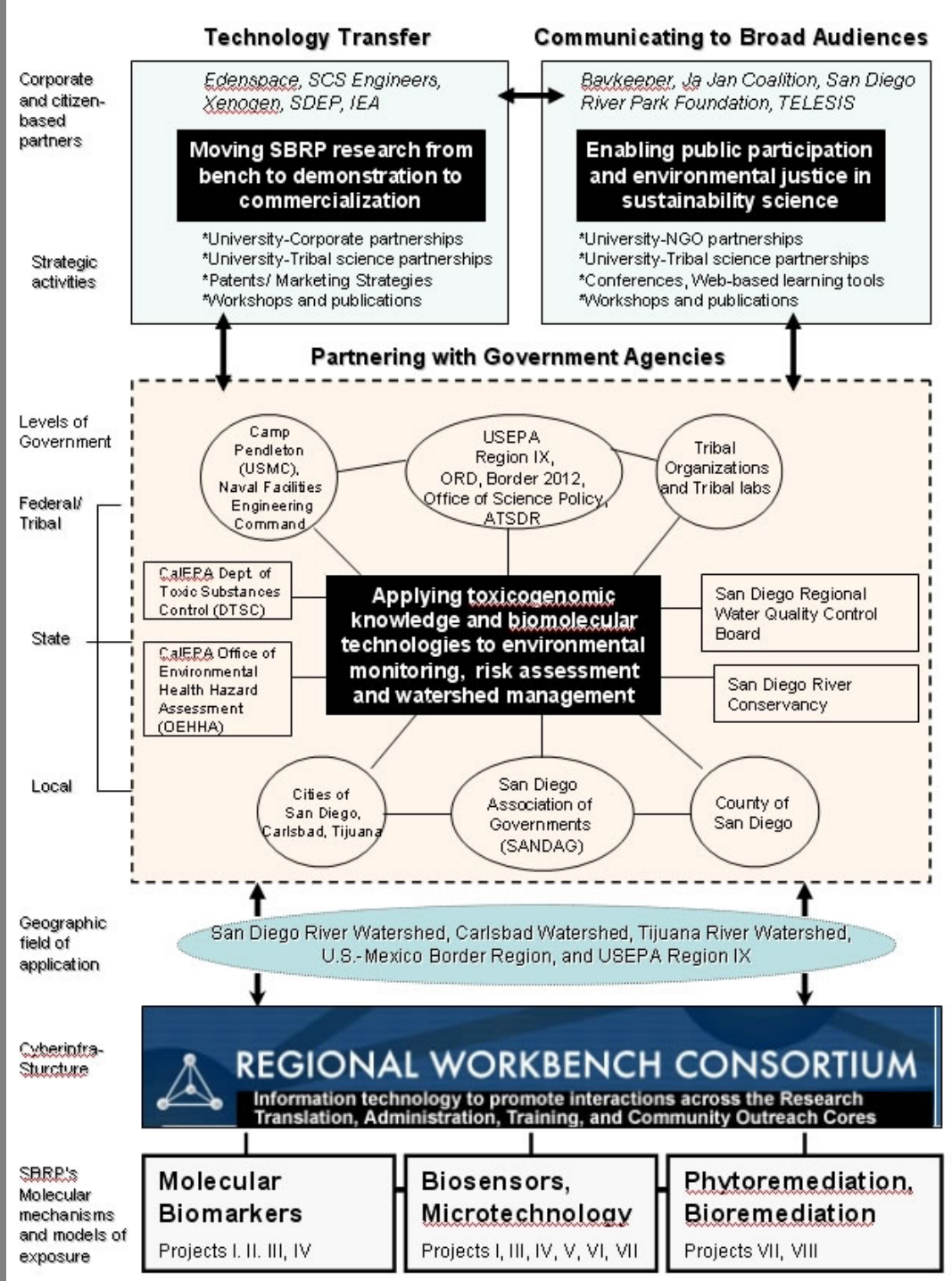
SBRP science

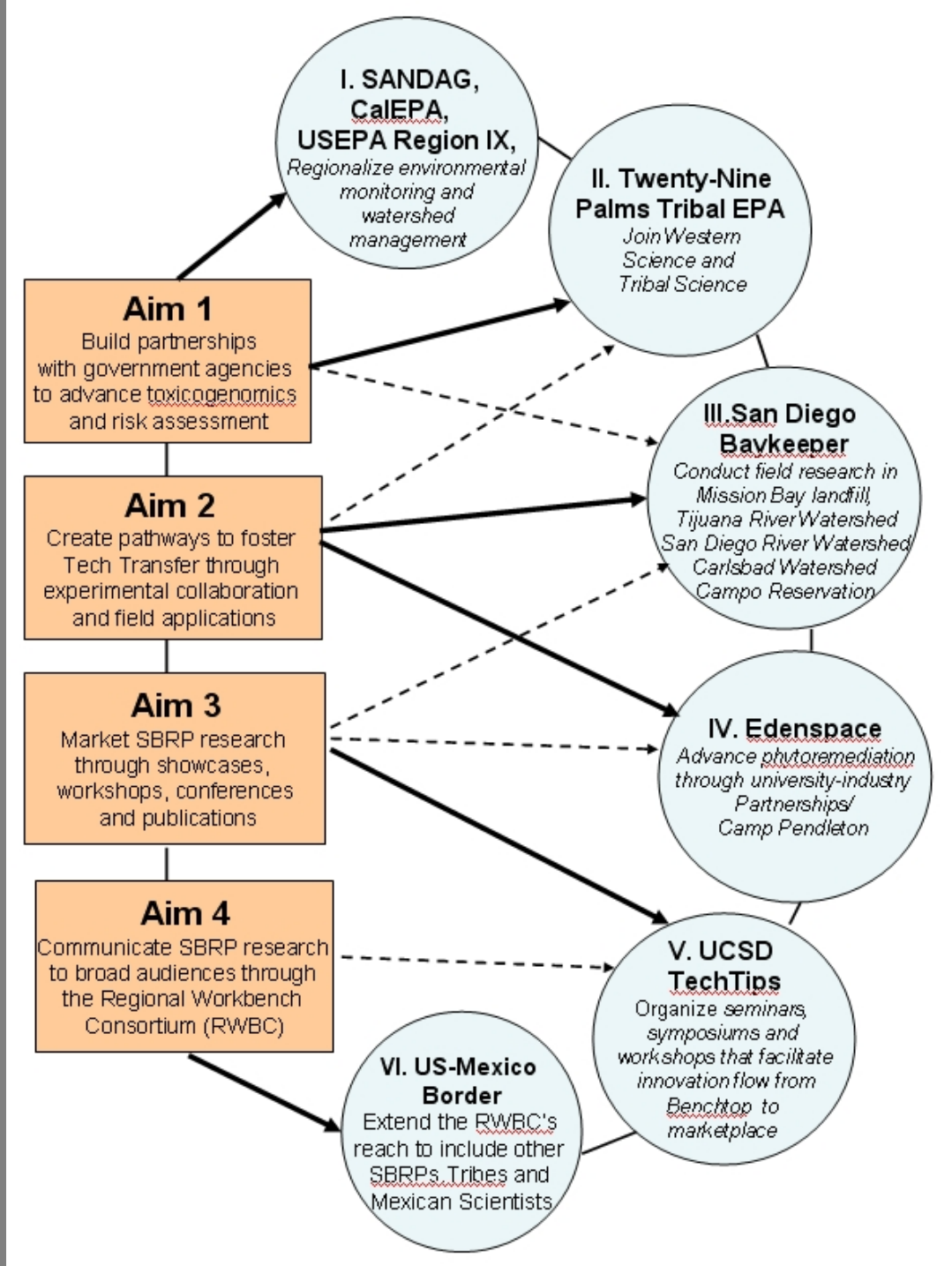
SBRP org chart

Research Translation Core

Aims and activities

A selection of images from the proposal, click thumnail for larger version.


Technology Transfer
Communicating to Broad Audiences
Corporate and citizen-based partners
Edenspace, SCS Engineers, Xenogen, SDEP, IEA
Baykeeper, Ja Jan Coalition, San Diego River Park Foundation, TELESIS
Moving SBRP research from bench to demonstration to commercialization
Enabling public participation and environmental justice in sustainability science
Strategic activities
*University-Corporate partnerships
*University-Tribal science partnerships
*Patents/ Marketing Strategies
*Workshops and publications
*University-NGO partnerships
*University-Tribal science partnerships
*Conferences, Web-based learning tools
*Workshops and publications
Partnering with Government Agencies
Levels of Government
Federal/ Tribal
State
Local
Camp Pendleton (USMC), Naval Facilities Engineering Command
USEPA Region IX, ORD, Border 2012, Office of Science Policy, ATSDR
Tribal Organizations and Tribal labs
CalEPA Dept. of Toxic Substances Control (DTSC)
CalEPA Office of Environmental Health Hazard Assessment (OEHHA)
Applying toxicogenomic knowledge and biomolecular technologies to environmental monitoring, risk assessment and watershed management
San Diego Regional Water Quality Control Board
San Diego River Conservancy
Cities of San Diego, Carlsbad, Tijuana
San Diego Association of Governments (SANDAG)
County of San Diego
Geographic field of application
San Diego River Watershed, Carlsbad Watershed, Tijuana River Watershed, U.S.-Mexico Border Region, and USEPA Region IX
Cyberinfra-Sturcture
REGIONAL WORKBENCH CONSORTIUM
Information technology to promote interactions across the Research Translation, Administration, Training, and Community Outreach Cores
SBRP's Molecular mechanisms and models of exposure
Molecular Biomarkers
Projects I. II. III, IV
Biosensors, Microtechnology
Projects I, III, IV, V, VI, VII
Phytoremediation, Bioremediation
Projects VII, VIII


I. SANDAG, CalEPA, USEPA Region IX,
Regionalize environmental monitoring and watershed management
II. Twenty-Nine Palms Tribal EPA
Join Western Science and Tribal Science
Aim 1
Build partnerships with government agencies to advance toxicogenomics and risk assessment
III.San Diego Baykeeper
Conduct field research in Mission Bay landfill, Tijuana River Watershed San Diego River Watershed Carlsbad Watershed Campo Reservation
Aim 2
Create pathways to foster Tech Transfer through experimental collaboration and field applications
IV. Edenspace
Advance phytoremediation through university-industry Partnerships/ Camp Pendleton
Aim 3
Market SBRP research through showcases, workshops, conferences and publications
V. UCSD TechTips
Organize seminars, symposiums and workshops that facilitate innovation flow from Benchtop to marketplace
Aim 4
Communicate SBRP research to broad audiences through the Regional Workbench Consortium (RWBC)
VI. US-Mexico Border
Extend the RWBC's reach to include other SBRPs Tribes and Mexican Scientists

Science, Standards and the TMDL Process In The Urban Watershed Context


Hiram Sarabia
Citizen Science: Training Session


Water Quality Sampling Methods Training

OK, so you're ready to devise an evaluation plan for your research translation and/or outreach core.

Now what?

1. Set the agenda and participatory incentive structure (what gets on your radar screen? who gets to put it there, how? why?)
2. Operationalize your measures of success (define your metrics, qualitative/quantitative indicators) and methods for ongoing data collection.
3. Listen to learn
4. Interpret the results, archive findings and modify your approach accordingly

1. Set the agenda and participatory incentive structure (what gets on your radar screen? who gets to put it there, how? why?)

<u>Establish a purposeful context and inclusive process that is mutually rewarding for those who you need/expect to participate.</u>

- Use the RFA's conceptual architecture
- Relate your work to EPA/ATSDR
- Identify initial targets in collaboration with your strategic partners including the scientists (to do this well you might first need to go through a "vision and requirements" clarification process).
- Define an incentive structure (figure out how to motivate participation in the process; be entreprenurial).

US EPA Region IX, Strategic Plan, 2004	<u>Select Goals aligned with the US EPA's 2003-2008 Strategic Plan</u> •Improve Water Quality on a Watershed Basis **(Aim 1 & 2)** •Improve Coastal and Ocean Waters **(Aim 1 & 2)** •Cleanup and Reuse Contaminated Land **(Aim 2)** •Reduce Exposure to Toxic Pesticides **(Aim 2)** •Sustain and Restore US-Mexico Border Ecosystems **(Aim 1 & 4)** •Build Tribal Capacity **(Aim 1 & 4)** •Improve Environmental Information Systems **(Aim 4)** •Engage in joint work with CalEPA and US EPA (including Water Program Issues, Mexican Border, Information Management, and Environmental Indicators) **(Aim 1)**
ATSDR Goals, accessed on-line, May 2004	•Evaluate human health risks from toxic sites and releases and take action in a timely and responsive public health manner **(Aim 2)** •Ascertain the relationship between exposure to toxic substances and disease **(Aim 2)** •Develop and provide reliable, understandable information for people in affected communities and Tribes, and stakeholders **(Aim 4)** •Build and enhance effective partnerships **(Aim 1 & 4)**

SBRP Projects	New Biological Models and Technologies	Applications
5 biomedical and 2 non-biomedical projects	*Aimed at understanding the impact of Superfund hazardous substances on cellular signaling mechanisms, toxicity, metabolism, endocrine function and overall physiology.*	*New and improved biological models and technologies for hazardous substance detection, assessment, evaluation, and remediation.*
Molecular Biomarkers		
Karin (1) Russell (2) Evans (3) Tukey (4) Tebo (8)	• Genetically modified mice that are highly sensitive to oxidative stress as well as non-genotoxic and genotoxic hepatocarcinogens. • Strains of S. pombe that are sensitive to oxidative stress response. • Transgenic mice sensitive to PXR and CAR receptor ligands. • New cell lines that can detect xenobiotic receptor activators, Ah-receptor ligands, and arsenic. • Biological reagents to detect exposure to complex mixtures of hazardous substances.	• Model transgenic and genetically altered organisms (yeast, mice, cell-based systems) useful for risk assessment. • New biological methods for detecting/testing toxicants in water/soil/sediment samples. • New methods to assess the risk associated with exposure to mixtures of toxicants (e.g., identification of “signature” patterns of particular mixtures). • Development of biomarkers for heavy metal exposure and bioavailability (specifically hexavalant Cr, and, possibly Pb and Cu)

Confirm your labs interest by placing a check next to one of these applications. And list below a contact (yourself or someone else) that will serve as liaison between your lab and the RT and CO Cores.

SBRP Projects	New Biological Models and Technologies	Applications
Biosensors and Microtechnology		
Karin (1) Evans (2) Tukey (3) Taylor (6) Schroeder (7)	•Microscale liver tissue modeling technologies. •Bioengineered ('biomimetic') lab-on-a-chip platforms. •New detection methods for monitoring organophosphate inhibited acetylcholine esterase.Transgenic plants	•Reduce animal-animal variability associated with in vivo experiments •Bioengineered chips to explore new technologies for rapid screening of environmental toxicants •Fieldable biosensors to detect exposure to pesticides and heavy metals.
Phytoremediaton/Bioremediation		
Schroeder (7, Tebo (8)	•Transgenic plant technology for phytoremediation •Engineered organisms (aerobic and anaerobic) for enhanced bioremediation of heavy metals.	•Phytoremediation of heavy metal contaminated soils. •Microbial detoxification (bioremediation by immobilization) of hexavalent metals. •Bioremediation of heavy metals (e.g., Cr, Pb, Cu, Ni, Zn, Cd, As).

Confirm your lab's interest by placing a check next to one of these applications. And list below a contact (yourself or someone else) that will serve as liaison between your lab and the RT and CO Cores.

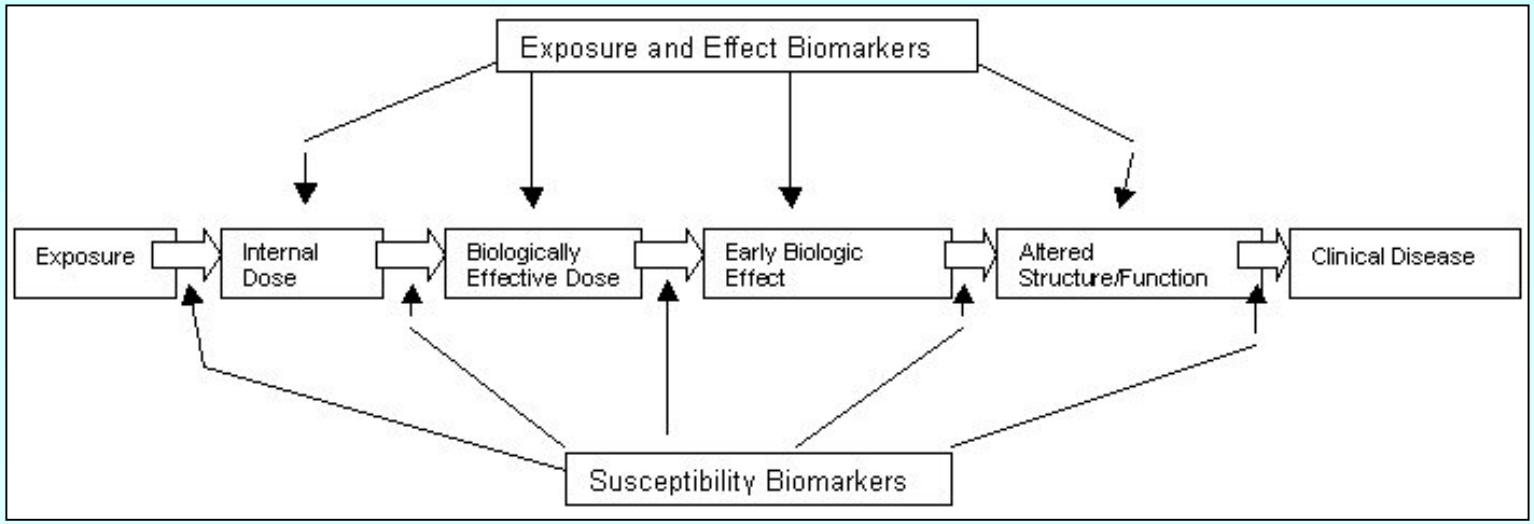


Figure 1 (Adapted from DeCaprio, 1997); cited in **Funding Opportunities Application of Biomarkers to Environmental Health and Risk Assessment** *FY 2004 Science to Achieve Results (STAR) Program.*

EPA INTEREST in BIOMARKERS

EPA, through the STAR program, is interested in supporting research that provides validation, interpretation and/or application of currently known biomarkers. Of special interest is the use of multiple biomarkers that can fill knowledge gaps across different points of the exposure-dose-effect continuum and/or that can be applied in a clinical setting. Any of the following areas are of interest:

•Mechanistic studies (e.g., using genomics or proteomics) of toxicant response linked to clinical disease. For example, the identification of the functional relevance of proteins where genetic polymorphisms have been found to modify the effect of an environmental exposure on a disease endpoint.

•Studies to validate the utility of biomarkers for use in large population studies (e.g., reliability, predictive value, sensitivity, specificity, affordability, applicability to the general population and susceptible subpopulations).

Biomarkers of Environmentally Associated Disease: Technologies, Concepts, & Perspectives
Written by Samuel H. Wilson , William A. Suk , Bergman , Berwick , Perry Blackshear Published by CRC Press (19 June, 2002)

International Conference: Biomarkers for Toxicology and Molecular Epidemiology, New Tools for 21st-Century Problems

*The National Center for Environmental Health/Agency for Toxic Substances and Disease Registry (NCEH/**ATSDR**) March 15-17, 2004, in Atlanta, Georgia.*

Examine ways that cutting-edge biotechnology/molecular tools may be applied to several public health problems through technology transfer. Discuss the latest developments in biosensor and other new analytical technologies **that can be utilized** for rapid, field-usable exposure assessments of environmental chemicals as well as for chemical terror agents.

Evaluate the latest developments in the application of molecular "omics" technologies (genomics, proteomics, and metabolomics). These biomarker classes can be used to **evaluate** early responses to toxic agents such as arsenic in drinking water, which is a global public health problem that affects the United States and many other countries.

Examine these new molecular tools in relation to populations at special risk for toxicity from chemicals (e.g., children). **Attendees will seek to determine ways that these modern tools can be used to provide improved risk assessments for protecting children against environmental chemicals.**

2. Operationalize your measures of success (define your metrics, qualitative/quantitative indicators) and methods for ongoing data collection.

- Quantify your SBRP's output/contributions in the categories listed by Dr. Wilson and Dr. Suk (e.g. publications, awards, patents, service to the EPA).
- Do your homework and find studies that include indicators or metrics relevant to your aims.
- Leverage related research and educational efforts on your campus (e.g., ICT and sustainability science, policy and planning, curriculum mandated service learning and field research requirements) to build in an ongoing data collection system.

Biomarker-Based Analysis for Contaminants in Sediments/Soil: Review of Cell-Based Assays and cDNA Arrays (ERDC TN-DOER-C19, December 2000)

Cell-based biomarker assays and cDNA arrays have the potential to be rapid, sensitive, and low-cost tools for sediment/soil toxicity screening.

The P450RGS assay illustrates the potential savings and benefits offered by cell-based assays. Although gas chromatography-mass spectroscopy (GC-MS) is the definitive method for identifying and determining the precise amount of dioxin and dioxin-like compounds present in an environmental sample, the method is expensive (~$1,200 -$2,000 per sample). P450RGS is far less expensive at about $200 per sample, and its use can result in major cost savings when used to screen multiple sediment cores to determine which samples should be confirmed by GC-MS.

Inouye, L. S., and McFarland,V.A. (2000). “Biomarker-based analysis for contaminants in sediments/soil: Review of cell-based assays and cDNA arrays,” *DOER Technical Notes Collection* (ERDC TN-DOER-C19), U.S. Army Engineer Research and Development Center, Vicksburg, MS. www.wes.army.mil/el/dots/doer *http://el.erdc.usace.army.mil/dots/doer/pdf/doerc19.pdf*

Senior Sequence

Urban Studies & Planning

University of California, San Diego

News & Updates

NEWS AND KNOWLEDGE NETWORKING

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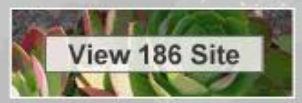

Sept. Dec. Jan. Mar.

3. Listen to learn (EPA)

Expoit the real power of evaluation (go beyond a mere number crunching exercise to justify funding levels).

Use the process to foster mutual learning and build social capital (enriched partnerships, knowledge networks and communication systems).

4. Interpret the results, archive findings and modify your approach accordingly

- Enrich your interpretative framework by incorporating insights from key disciplines/literature/methods in social science, information science and the humanities (organizational culture, social network analysis, new institutionalism, knowledge management).
- Create an archive of lessons learned, best practices that can be shared.

Suggested Next Steps:

•Enhance knowledge networking capacity for SBRP programs to **"federate distributed intelligence"** in the effort to link environmental health sciences to society for the common good--for example:

•1. Create a national database of best practices, literature, success/failure stories in evaluation methods/practice specific to SBRP research translation and community outreach

•2. Conduct a professionally mediated workshop (on evaluation training and standards) for all PIs and key staff of the RTCs and COCs

Contact info

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- kpezzoli@ucsd.edu

University of California, San Diego

SBRP, Research Translation/
Community Outreach Core